Exercise sheet 6: Unification (Solutions)

Exercise 1

(a) 1. $(X \equiv 2) \wedge (X \equiv 2)$ (by *decompose*)
2. $(2 \equiv 2) \wedge (X \equiv 2)$ (by *eliminate*)
3. $X \equiv 2$ (by *delete*)

Succeeds with X=2

(b) 1. $(X \equiv 2+2) \wedge (X \equiv 4)$ (by *decompose*)
2. $(4 \equiv 2+2) \wedge (X \equiv 4)$ (by *eliminate*)

Fails (by *conflict*)

(c) 1. $(X \equiv a) \wedge (Y \equiv g(b)) \wedge (Y \equiv g(b))$ (by *decompose*)
2. $(X \equiv a) \wedge (g(b) \equiv g(b)) \wedge (Y \equiv g(b))$ (by *eliminate*)
3. $(X \equiv a) \wedge (Y \equiv g(b))$ (by *delete*)

Succeeds with X=a and $Y = g(b)$

(d) 1. $(X \equiv a) \wedge (b \equiv Y)$ (by *decompose*)

Fail as target contains a variable.

Exercise 2

(a) 1. $(X \equiv a) \wedge (b \equiv Y)$ (by *decompose*)
2. $(X \equiv a) \wedge (Y \equiv b)$ (by *switch*)

Succeeds with X=a and $Y = b$

(b) 1. $(X \equiv Y) \wedge (b \equiv a)$ (by *decompose*)

Fails

(c) 1. $(X \equiv f(Y)) \wedge (a \equiv Y)$ (by *decompose*)
2. $(X \equiv f(Y)) \wedge (Y \equiv a)$ (by *switch*)

3. $(X \equiv f(a)) \wedge (Y \equiv a)$ (by *eliminate*)

Succeeds with $X \equiv f(a)$ and $Y \equiv a$.

(d) 1. $(X \equiv f(Y)) \wedge (g(X) \equiv Y)$ (by *decompose*)
2. $(X \equiv f(Y)) \wedge (g(f(Y)) \equiv Y)$ (by *coalesce*)
3. $(X \equiv f(Y)) \wedge (Y \equiv g(f(Y)))$ (by *switch*)

Fails due to occurs check.

(e) 1. $(a + X \equiv a) \wedge (b \equiv Y)$ (by *decompose*)
2. $(a \equiv a + X) \wedge (b \equiv Y)$ (by *switch*)

Fails due to occurs check.